

## GLOBAL BROADCAST SERVICE (GBS)



### DoD ACAT ID Program

Total Number of Receive Suites:	493
Total Program Cost (TY\$):	\$458M
Average Unit Cost (TY\$):	\$928K
Full-rate production:	3QFY01

### Prime Contractor

Raytheon Systems Company

### SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Global Broadcast Service (GBS) will augment and interface with other communications systems and provide a continuous, high-speed, one-way flow of high-volume data, audio, imagery, and video information streams to deployed and garrisoned forces across the globe. GBS will support routine operations, training and military exercises, special activities, crisis response, situational awareness, weapons targeting, and intelligence. GBS will also support the transition to and conduct of operations short of nuclear war. GBS will quickly disseminate large information products to various small user platforms worldwide. As an extension of the Defense Information Systems Network (DISN), GBS will employ an open architecture to ensure compatibility with a variety of DISN formats. GBS is designed to provide the warfighter with the *information superiority* necessary to act inside the decision cycle of the adversary and execute *precision engagement* as the *dominant maneuver* force during activities leading up to and during armed conflict.

GBS consists of a space segment, fixed and transportable transmit suites, and fixed and transportable receive suites. The space segment of the current phase of GBS will consist of three Ultra High Frequency Follow-On (UFO) satellites, each modified with four GBS transponders and an undetermined number of leased commercial satellites. Transmit suites build broadcast data streams from various sources of information, including command, weather and intelligence agencies, and commercial television programming such as the Cable News Network. They manage the flow of selected information through the uplink broadcast antenna to the orbiting satellites for broadcast to the appropriate theaters of operation. The receive suites reverse this process and distribute the information to the appropriate end users within selected areas of operation.

## **BACKGROUND INFORMATION**

The current military satellite communications architecture does not meet modern, high-data dissemination rate requirements such as video and imagery transmission. Current military satellite assets either are unable to support, or would have difficulty delivering, multi-megabit broadcasts to multiple receivers using small antennas, including mobile users, without significantly limiting or curtailing other critical two-way voice and data services to the warfighter. The Conduct of the Persian Gulf War—The Final Report to Congress, April 1992, highlights the limited ability of current military and civilian satellite communication systems to provide responsive, high-capacity communications to deployed, mobile tactical units. GBS is designed to fulfill that need.

The GBS acquisition strategy is a three-phase program based on an evolutionary system design supported by commercially available technology. The program is currently in Phase II. GBS Phase I, conducted from FY96-FY98, was used to develop the user requirements and concepts of operations. Phase I focused on the Battlefield Awareness and Data Dissemination project, an Advanced Concept Technology Demonstration, and the Bosnian Command/Control Augmentation effort, both sponsored by the Defense Advanced Research Projects Agency. GBS Phase II, scheduled for completion in FY06, will develop near-worldwide GBS core operational capability and further refine operational requirements and employment concepts. In keeping with the evolutionary design strategy, software configurations for the Phase II GBS system will be incrementally upgraded to full functional capability as improved commercial software capabilities become available. While substantial hardware redesign has been necessary to meet military requirements, it is expected that the hardware design will remain relatively stable throughout Phase II. GBS Phase III, scheduled to begin for FY06 and beyond, is currently undefined.

Milestone II for the GBS Phase II system occurred in November 1997. In June 1999, the GBS Joint Program Office submitted a Program Deviation Report to the Milestone Decision Authority notifying him of a breach in the Acquisition Program Baseline schedule. Milestone III, currently scheduled for 1QFY00, is expected to slip to 3QFY01 in a restructured Phase II GBS program. The schedule breach is attributed to construction delays at the Sigonella, Italy transmit site, delay of the launch of UFO-10, as well as problems with transmit suite software and design problems with the transportable and fixed receive suites.

## **TEST & EVALUATION ACTIVITY**

GBS Phase I is complete. Phase I demonstrated that the core technologies required to execute the GBS program have been developed and that a GBS-like capability has military utility.

The Phase II GBS TEMP was due to DOT&E in July 1999, but has been delayed several months as a result of Service operational tester and System Program Office difficulties in finalizing the combined developmental and operational test strategies. Technical issues in the program and numerous personnel changes in the Army, Navy, Marine, and Air Force Combined Test Force Team, further complicated this process. These issues are indicative of the technical and management challenges the GBS program has faced throughout its short history. Indications are that technical and personnel issues have been resolved and developmental and operational test programs appear to be back on track. The Phase II TEMP is currently in Service coordination prior to being sent forward for DOT&E approval. Submission of operational test plans will follow shortly thereafter.

The Phase II TEMP outlines a combined test and evaluation approach that complements the evolutionary development of the GBS system. A Combined Test Force was formed to coordinate the planning of all GBS system testing. Members of the Combined Test Force include representatives from the using commands, the program office, the development contractors, and the Army, Navy, Air Force, and Marine Corps operational test agencies. A series of six development tests and a Multi-Service OT&E (MOT&E) are planned in the restructured Phase II Program. The operational test agencies participated in developmental testing as members of the Combined Test Force and have provided feedback to the development community. Developmental test events have included factory acceptance tests, site acceptance tests, Y2K tests, shipboard receive suite tests, and on-orbit tests of UFO satellites 8 and 9. Developmental testing has recently been modified to include a government confidence test to verify system threshold performance after launch of UFO satellite 10 and before MOT&E. This confidence test will replicate many MOT&E events in order to increase confidence that the GBS system hardware, software, and personnel are fully ready for the near-global MOT&E of a fully capable GBS system in 1QFY01.

UFO satellite 8, the first UFO satellite equipped with a GBS payload, was successfully launched from Cape Canaveral Air Station on March 16, 1998. Checkout of the UFO/GBS satellite payload was completed in June 1998, and the satellite was declared ready to support GBS transmit and receive suite testing in the Pacific region. However, the combined DT/OT, which was to begin at that time, was postponed because of software development and security-related issues impacting the fixed transmit suite in Hawaii and fixed receive suites in Korea. These tests were conducted from October 1998-January 1999, after the Program Office evaluated and accepted the contractor's fixes, revised master schedule, and development approach. However, testing revealed numerous performance, quality, reliability and durability problems with both the fixed and transportable ground receive suites. Both have undergone a complete redesign since that time.

The original plan was to deliver and test the ground software in three increments of increasing maturity. The increments were to coincide with the arrival of the three GBS payloads (UFO satellites 8, 9, and 10) in orbit, culminating in the final operational version at MOT&E. As the result of ground system software delays and receive suite hardware design problems, incremental DT/OT has been modified. As discussed above, incremental DT/OT plans now heavily rely on the government's confidence test period prior to MOT&E. This eliminates the advantages of the previously planned incremental testing and increases the probability of finding serious operational shortcomings during MOT&E.

The Program Office and Combined Test Force face continuing challenges resulting from GBS delivery schedule changes. Although the basic combined test concept remains sound, changing schedules, resource uncertainties, and adjustments to test objectives continue to put timely development of detailed test plans and orderly execution of the overall acquisition and test strategies at risk.

## **TEST & EVALUATION ASSESSMENT**

The Data Dissemination and Bosnian Command/Control Augmentation efforts have demonstrated the potential capability and military utility of the GBS system. The Program Office is incorporating lessons learned from these efforts into the GBS system design, and the user commands are aggressively developing their concept of operations based on their early field experiences.

The software and hardware problems have been significant and have taken great effort and many months to correct. The strategy of having transmit and receive suites in place for test and within the footprint of each of the three UFO/GBS satellites in time to start system testing immediately after satellite checkout has been only marginally executable due to various schedule slips. The tests are being performed, but the satellites may be on orbit for several months before system testing begins. As GBS equipment delivery dates and locations change, the test program, including the TEMP and detailed test plans, must be regularly updated to keep pace with the changes. Despite this, we view the risk to eventual program success as medium to low. The recent extension of the Acquisition Program Baseline dates should reduce risk to the schedule and overall program success.

The GBS system contractor has overall responsibility for Y2K testing. Factory testing is done to certify that each of the system's segments are Y2K compliant. Additionally, combined DT/OT tests scheduled for 1999 will verify Y2K compliance using time-phased scenarios to demonstrate system functionality following rollover of the Central Processing Unit clock from 1999 to 2000 and back. GBS will additionally be tested to recognize and operate through the millennium crossing date, leap dates, and other known challenging dates. The Program Office is responsible for formal Y2K compliance certification. They plan to verify compliance using the Air Force's Year 2000 Certification Checklist no later than December 17, 1999.

The GBS program continues to encounter and resolve many technical and operational issues. DOT&E views the following issues as the most challenging issues in the months before MOT&E:

- Integrating GBS into the existing Information Dissemination Management structure sufficiently to demonstrate GBS operational capabilities.
- Finalizing concepts of operations and agreement among competing Theater Commander in Chiefs' (CINCs) regarding appropriate use of GBS and sharing of satellite broadcast resources to support conflicting regional needs in time of crisis.
- Refining the roles and responsibilities and creating appropriate training for Theater Information Managers. This challenge is complicated by the fact that each Theater CINC may have a unique view of how the Theater Information Manager position should be staffed and executed.

- Concluding preparations for, and executing the government confidence test in time to take full advantage of the period to validate that the GBS system is technically capable, and that personnel are adequately trained, prior to the start of MOT&E.

## **RECOMMENDATIONS**

The GBS Program Office should:

- Continue to work aggressively with the Information Dissemination Management office to ensure that the appropriate architectures are in place to support a successful MOT&E and terminal fielding.
- Continue to work with the operational user community to finalize the concepts of operation, which define how the GBS system will be used in the field.
- Finalize planning and resourcing of the government confidence test. A well-executed confidence test should provide many insights into GBS operations and greatly improve chances of a successful MOT&E.

The Combined Test Force should:

- Provide their fullest support to the Program Office in their planning and execution of the government confidence test. They should ensure that lessons learned from this confidence test are used to improve the MOT&E.
- Complete individual and combined Service operational test plans associated with MOT&E. Provide plans and associated briefings to DOT&E as soon as possible.

## **LESSONS LEARNED**

Initial hopes of basing GBS on commercial-off-the-shelf technology, to eliminate the challenges of a traditional high-technology acquisition program, have not been realized. More development was required than originally presented in the acquisition plan. Careful review of future programs proposed as “commercial-off-the-shelf” or “non-developmental item” acquisitions is warranted to ensure that all known development necessary to meet operational requirements is clearly understood and presented in the acquisition plan. Although Phase I demonstrated strong system potential, the software maturity issues and ground receive suite design problems demonstrate that commercial availability of a basic technology does not necessarily translate into rapid system development and integration into the military environment. The Joint Program Office found it necessary to request schedule and cost relief to realign expectations with reality.

